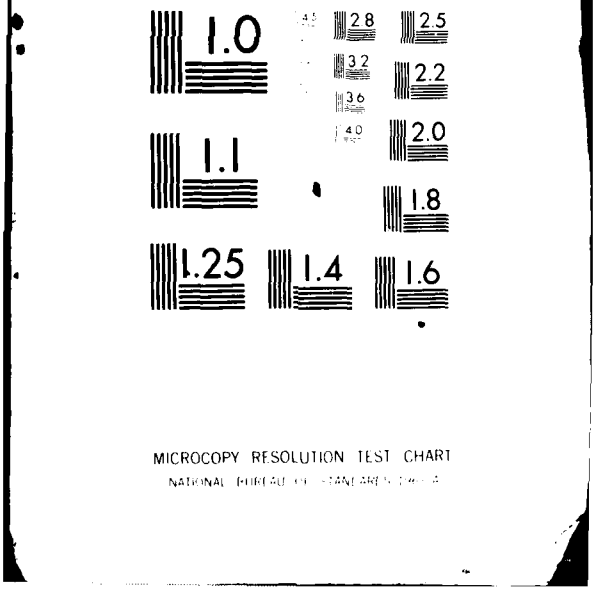
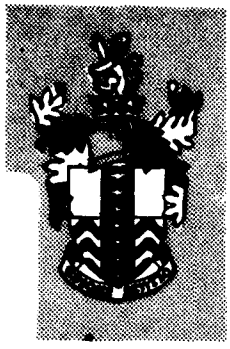
AD-A113 198 ROYAL SIGNALS AND RADAR ESTABLISHMENT MALVERN (ENGLAND) F/G 13/8
A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED WAVEGUIDE TH--ETC(U)
FEB 82 N HARRIS

UNCLASSIFIED RSRE-MEMO-3438 DRIC-BR-82721 NL


1.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6
MICROCOPY RESOLUTION TEST CHART

(2)



RSRE
MEMORANDUM No. 3438

ROYAL SIGNALS & RADAR ESTABLISHMENT

A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED WAVEGUIDE THERMAL ISOLATING SECTIONS

Author: N Harris

RSRE MEMORANDUM No. 3438

PROCUREMENT EXECUTIVE,
MINISTRY OF DEFENCE,
RSRE MALVERN,
WORCS.

ROYAL SIGNALS AND RADAR ESTABLISHMENT

Memorandum 3438

Title: A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED WAVEGUIDE THERMAL ISOLATING SECTIONS

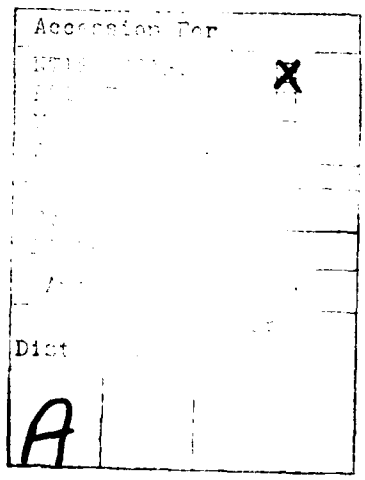
Author: N Harris

Date: February 1982

SUMMARY

This report outlines a chemical milling process by which the wall thickness of copper waveguide sections can be reduced to 0.10 mm (0.004 ins).

The process permits flange machining and lapping of the relevant component to be completed prior to the reduction of the wall thickness, thereby eleminating the possibility of damage to the fragile section during these operations.



RSRE MEMORANDUM NO 3438

A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED WAVEGUIDE THERMAL ISOLATING SECTIONS

N Harris

CONTENTS

1 INTRODUCTION

Thermal isolating sections as used in UK National Microwave Standards require waveguide assemblies in which the wall thickness is required to be reduced to 0.10 mm (0.004 ins) in one or more areas of the waveguide.

Previously the thin walled sections were produced by electroforming and machining which involved the manufacture of high cost mandrels and unavoidably long electroforming time.

The fragile thin walled sections produced presented handling problems during the machining and lapping processes, also rippling of the walls occurred during mandrel withdrawal.

The introduction of a chemical milling process has proved to be highly successful, standard waveguide sections have replaced electroforms, the process is carried out easily and quickly and the thin walled areas are produced as a final operation after all flange machining and lapping has been completed.

2 CHEMICAL MILLING PROCEDURE

Masking

Mask off using Lacomite[1] stopping off medium, air dry and repeat. As an additional protection for the precision lapped flange faces and for sealing off waveguide apertures and fixing holes seal off flange ends with plating tape[2].

Etching and Measurement

Submerge in Plutinex[3] stripper solution (40% nitric acid, 45% fluoboric acid) until the desired wall thickness is achieved. With new solution erosion rate being approximately 25 μm (0.001 ins) per 3½ mins.

During final stages of etching period micrometer measurements are necessary and the finished guide width can be controlled to better than 50 μm (0.002 ins) ie 25 μm (0.001 ins) on wall thickness.

Measurements should be taken along edge of waveguide thereby eleminating possible distortion of the final fragile walls and degradation of the internal profile. See figure 1.

Remove from etchant, neutralise and thoroughly wash. Remove Lacomite by immersion in acetone.

3 PROTECTIVE REINFORCEMENT

Reinforce thinned areas as shown in figure 2. "Potting" should not be employed as an alternative, shrinking of the resin will distort the inner profile of the waveguide.

General

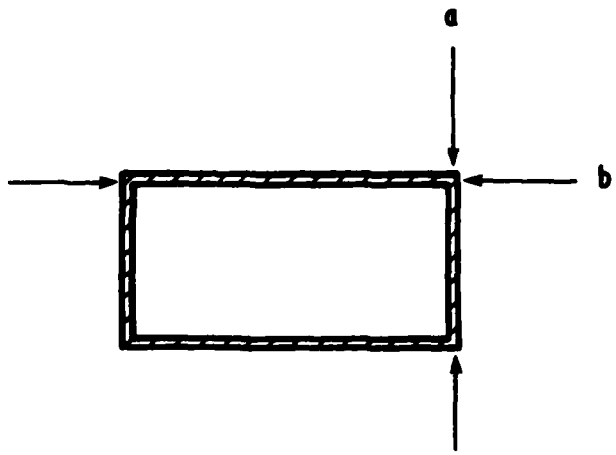
Experiments were carried out using nitric acid in various strengths as an alternative etching medium. In all cases etch was irregular with considerable undercutting adjacent to the masked areas.

REFERENCES

1 W Canning and Co Ltd.

2 Minnesota Mining and Mfg Co - Scotch Brand.

3 Schloetter Co Ltd, Abbey Works, Pershore, Worc's.



W/G SIZE	DIM a (INS)	DIM b (INS)
18	.319 TO .321	.630 TO .632
22	.148 TO .150	.288 TO .290
27	.060 TO .062	.110 TO .112
29	.041 TO .043	.073 TO .075
30	.034 TO .036	.059 TO .061

FIG. 1

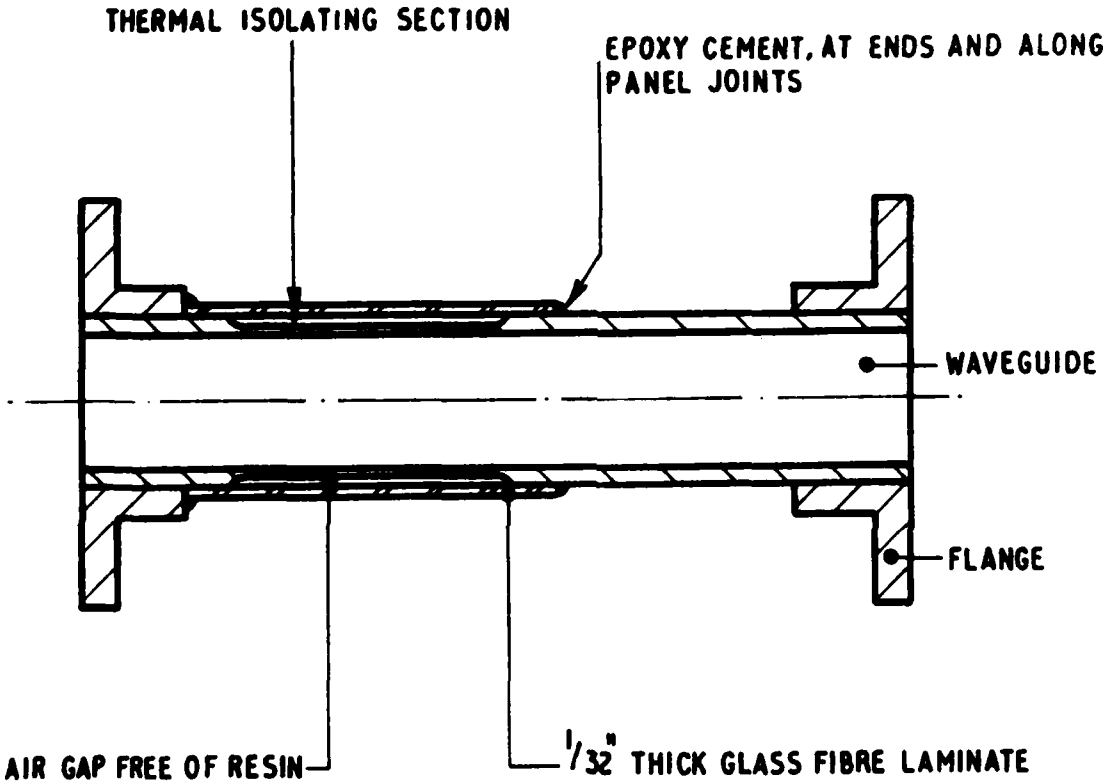

THERMAL ISOLATING SECTION
EPOXY CEMENT, AT ENDS AND ALONG PANEL JOINTS
WAVEGUIDE
FLANGE
AIR GAP FREE OF RESIN
1/32" THICK GLASS FIBRE LAMINATE

FIG. 2